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tion and a number of new subjects have been included. For an interesting review of the eighth edition see E. B. Van Vleck, *Bulletin of the American Mathematical Society,* 1896. The author has taken into account, in the later editions, some of the points raised by Professor Van Vleck.

E. J. W.

Leçons de Mathématiques Générales. By L. ZORETTI. xvi+753 pp. Gauthier-Villars, Paris, 1914. 20 francs.

This book is intended as a text to be used by those students in the French universities who, while not specializing in mathematics, find it necessary to study mathematics in preparing for their future careers. The book is admirably suited to its purpose, and American college teachers will find it interesting to note that, to a very considerable extent, the contents of this book coincide with what they usually present to their students in their courses in analytic geometry and calculus. There are included however a number of topics not usually treated in our American courses, and it would seem to be a question well worthy of serious thought, whether some or all of these subjects might not be as valuable to American as to French students of this class. The book is introduced by a preface written by Professor Appell, which discusses with great lucidity the pedagogic situation involved.

E. J. W.

Historical Introduction to Mathematical Literature. By G. A. MILLER. The Macmillan Company, New York. xiii+302 pp. $1.60.

This, the most recent product of Professor Miller's prolific pen, is a real innovation in mathematical literature. The plan and scope of the volume, its purposes and contents, make it differ in kind from any other book about mathematics with which the reviewer is acquainted.

As the author tells us, the book found its origin in a series of lectures which were intended to supplement the regular mathematical courses. Naturally the book itself has turned out to be something partaking of the nature of a supplement, exhibiting a certain lack of unity and a rather noticeable looseness of connection between its various parts. But each of these parts is itself well bound together, and the author expresses his views on a large number of questions in an interesting and forceful style, which frequently assumes the form of epigram.

Professor Miller feels, as many of us do, that something should be done to widen the perspective of our students of mathematics. He thinks that this can best be accomplished, by supplementing the detailed work, in problems and theorems, of the regular courses, by material of an informational and historical character. This is the need which we attempt to meet by "synoptic and inspirational courses." Professor Miller thinks that his book may serve as a basis for such courses, and also for a first course in the history of mathematics.

In regard to the history of mathematics, the author takes a rather novel and interesting point of view. He thinks that a first course in this subject should

discuss "recent mathematical events and developments" rather than the mathematics of the ancients, and he presents some strong arguments in favor of this view. In fact, it is evident that historical study of any sort is apt to degenerate into mere text-book work, unless the primary sources of information are, at least in part, available for the use of the student. And it is certainly not an easy matter to establish direct connections with the sources of ancient mathematics, on account of the linguistic difficulties involved. By concentrating attention on more recent developments, some genuine historical study becomes possible even for those who know English only. Again, the author points out how very essential such detailed historical investigations and comparisons become, if we wish to arrive at a correct interpretation of even such a simple historical statement, as "Newton discovered the binomial theorem." The greater ease with which this can be done for more recent mathematical developments, as compared with the obscurity which necessarily surrounds the origins of various ideas transmitted to us by the Ancients, makes it fairly evident that we can hardly hope to understand the latter except by means of the light which is thrown upon intellectual origins in general by studies of the former kind.

Of course there are serious difficulties in the way of carrying out a program of this kind for the history of mathematics. The mathematics of the ancients not only came first chronologically, but much of it comes first logically and heuristically, as a prerequisite for later developments. Thus, much of the ancient mathematics is simpler and more easily understood than most of the modern work based upon it. But the simplicity of the ancient mathematics, as contrasted with the modern, is very much exaggerated by our traditional methods of teaching, methods which are being modernized very slowly indeed. As a matter of fact, many notions of the so-called higher mathematics are much simpler, and much more important, than many of the things now taught in every high-school. Nothing could be more helpful in advancing mathematical education than a thoroughgoing revision of the mathematical curriculum of the secondary schools from this point of view. I believe that a combined synoptic and historical course, still largely based on the chronological order, but taking into account only the most essential developments of both ancient and modern times, would furnish the best solution of the educational problem in which Professor Miller is interested, namely, to secure an intelligent appreciation, by educated people in general, of the rôle of mathematics in human thought and in the history of civilization. I feel that such a plan would be even more satisfactory than that outlined by Miller, but nevertheless his point of view is very suggestive.

Professor Miller's book brings together much information of great value which is not easily available elsewhere. Chapter II, which discusses the various kinds of mathematical literature, and the appendix, "Lists of important works," alone are worth the price of the book. Every one who has attempted to direct advanced students, knows how difficult it is for them to find their way through the literature. I feel that, from now on, my troubles in this direction, at least, are at an end. I shall ask them to read Miller's "Introduction."

Chapter VII contains interesting sketches of twenty-five "deceased mathematicians." There are at least two serious omissions in this list, Jacobi and Riemann. Jacobi, to be sure, is mentioned several times in other parts of the book; but even in the sketch of Abel, no mention is made of Jacobi's fundamental contributions to the theory of elliptic functions. Riemann's name does not occur anywhere in the book, so far as I have been able to make out, although the theory of functions is mentioned several times, and although biographical sketches of Weierstrass and Cauchy are included among the twenty-five.

Professor Miller's book is a valuable contribution to popular mathematical literature, and should help to arouse a more general interest in mathematics. It deserves an honorable place in every mathematical library, and it should be read by all those who feel some interest in mathematics, especially if their mathematical education has been limited. They will, at least, find out that mathematics is not dead; that it is growing day by day, and far more rapidly now than in ancient times.

E. J. Wilczynski.

PROBLEMS AND SOLUTIONS.

Edited by B. F. Finkel and R. P. Baker.

[Send all Communications to B. F. FINKEL, Springfield, Mo.]

PROBLEMS FOR SOLUTION.

ALGEBRA.

460. Proposed by J. J. GINSBURG, Student, Cooper Union, New York.

Find the value of $\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+}}}}$ to infinity.

461. Proposed by E. T. BELL, Seattle, Washington.

(1) Two events have probabilities p, q, respectively. The events may be either (i) mutually independent; or (ii) mutually exclusive. Assign meanings to the symbol p^q, in terms of the two events, where p^q is written for $p \times p \times \cdots \times p$, ($q$ factors p), in cases (i), (ii), and $p \times p$ has the customary meaning (as a probability).

(2) What relations, if any, other than (i) or (ii) can exist between two events? Upon what postulates is the answer to this based?

462. Proposed by H. S. UHLER, Yale University.

Show how to transform A into S, where these symbols denote the equivalent formulæ for the general case of Calculus Problem No. 363, pages 52 and 54 in the February, 1916, Monthly:

$$A \equiv 4\pi R^2 - 4nR^2 \sin^{-1}\left(\frac{R\sin\dfrac{\pi}{n}}{\sqrt{R^2-a^2}}\right) + 2anR\sin^{-1}\left[\frac{2a\left(\tan\dfrac{\pi}{n}\right)\left(\sqrt{R^2-a^2\sec^2\dfrac{\pi}{n}}\right)}{R^2-a^2}\right],$$

$$S \equiv 4nR\left\{a\sin^{-1}\left(\tan\frac{\pi}{n}\cdot\frac{a}{\sqrt{R^2-a^2}}\right) - R\sin^{-1}\left[\tfrac{1}{2}\sin\frac{2\pi}{n}\cdot\frac{R-\sqrt{R^2-a^2\sec^2\dfrac{\pi}{n}}}{\sqrt{R^2-a^2}}\right]\right\}.$$